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a comparison between brazilian and spanish climate adaptation and mitigation policies

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Climate governance in perspective: a comparison between brazilian and spanish climate adaptation and mitigation policies

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Abstract: This study features a comparative analysis between Brazilian and Spanish climate adaptation and mitigation policies, with the aim of identifying Spanish best practices that may strengthen Brazilian climate governance. To this end, a survey, review and a critical analysis of legislation, strategies and programs related to the topic was conducted, covering the national, regional and local levels in both countries. In the Spanish case, the documentary analysis at the regional scale was focused on the Autonomous Community of Catalonia and the Metropolitan Area of Barcelona, with the city of Barcelona itself as local scale. On the Brazilian side, the research was conducted in the state of Goiás regionally and the municipality of its capital Goiânia locally. Based on the analysis, the progress and challenges present in both countries are highlighted, offering reflections on how Brazil could incorporate lessons learned from the Spanish experience to adapt and improve its legal and institutional structures. Finally, possible strategies for climate governance in Brazil are outlined, such as integrating administrative levels, ensuring climate finance, strengthening local governance, promoting climate justice, and a sustainable and inclusive energy transition.

Keywords: climate change; public policies; climate resilience

INTRODUCTION

Evidence of climate change is widely observed on a global scale, manifesting itself through increased average temperatures, warming and rising sea levels, reduced polar ice sheets, the migration of tropical disease https://doi.org/10.36311/2025.978-65-5954-580-3.p41-53

vectors and an increase in the frequency and intensity of extreme weather events in all regions of the planet (IPCC, 2021). These phenomena not only alter the climate system and cause environmental impacts, but also significantly affect key sectors like food and energy production, as well as water availability (Hoff, 2011; Mariani *et al.*, 2016). There is an increasing pressure on natural resources, exacerbating conflicts in various regions of the world and intensifying the migratory flows of so-called "climate refugees" (Hartmann, 2010; Biermann; Boas, 2010). The economic impacts of climate change are also notable, especially those associated with extreme events like floods, droughts, storms and heat waves, which result in significant material losses and increase reconstruction and recovery costs (Cassol; Bohner, 2012). In addition, the compromised climate affects the well-being and health of the population, in particular vulnerable groups, such as the elderly, children and the chronically ill, especially during heat and cold waves (Clayton, 2020; Masselot *et al.*, 2023; Romanello *et al.* 2024).

According to the Intergovernmental Panel on Climate Change (IPCC, 2021), climate change is widespread, accelerated and without historical precedent. Scientific literature points to the unquestionable anthropogenic influence on climate change on the planet (Cook *et al.*, 2013), including a possible point of no return (Lenton *et al.*, 2019; Armstrong Mckay *et al.*, 2022).

The IPCC (2022a, 2022b) highlights that there are viable options for reducing greenhouse gas emissions (mitigation) and minimizing climate impacts (adaptation), which involve energy efficiency, urban green infrastructure, waste management and sustainable management of forests, plantations and pastures. Other authors advocate degrowth, i.e. the reduction of resource consumption (Turiel, 2020). Thus, in view of the emergency of the climate crisis (Artaxo, 2020; Ripple, 2020, 2024), climate resilient development currently requires political governance. Political governance plays a fundamental role in establishing effective guidelines and actions to address the climate crisis (IPCC, 2022b). However, such governance must be adapted to national and local contexts, and promote the participation of civil society and the private sector. In addition, it needs international funding and cooperation (Taks, 2019). In this context, this chapter presents a comparative analysis between climate governance policies and strategies in Brazil and Spain, considering that both countries are signatories to international treaties and are committed to reducing the effects of climate change. The objective is to identify common advances and challenges, as well as Spanish best practices that can strengthen Brazilian climate governance, with a focus on the national, regional and local levels.

The methodology includes a documentary review and content analysis, supported by a literature review for critical analysis. The laws, programs and plans related to climate change were compiled from official sources in both Spain and Brazil. In Spain, the regional analysis focused on Catalonia and the Barcelona Metropolitan Area, and locally on the city of Barcelona. In Brazil, the regional level consisted of the state of Goiás and, locally, the municipality of its capital Goiânia.

After this contextualization, the text is organized into three main topics. The first presents an overview of climate policies in Spain and Brazil, including their history, scope and strategies. The second provides a comparative analysis of the relevant legislation in both countries. Finally, the third provides insights to strengthen Brazilian climate governance, based on the Spanish experience.

Spanish and Brazilian policies to combat climate change

In Spain, the 2006 National Climate Adaptation Plan (PNACC) was milestone in the coordination between different levels of government. It assesses impacts, vulnerabilities and adaptation and mitigation strategies for climate change. The plan established clear goals to achieve carbon neutrality by 2050, prioritizing strategic sectors such as water resources, biodiversity, health, agriculture and urban planning. In addition, the PNACC promoted the integration of these actions into regional and local policies, offering a comprehensive climate governance model. In 2021, the plan was updated for the period of 2021 to 2030, expanding its initial scope by adding principles of social equity, evidence-based science, integration in sectoral plans, as well as the mobilization of public and private actors.

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The PNACC is in line with international commitments, notably the Paris Agreement and European Union (EU) policies like the European Climate Adaptation Strategy, the European Green Deal and the Sustainable Finance Action Plan. Furthermore, the implementation of local actions was driven by EU funding, in particular the Next Generation EU program, which enabled infrastructure works, expansion of green areas and water resource management.

At the regional level, the Catalan Climate Change Law of 2017 stands out. It established guidelines to reduce greenhouse gas (GHG) emissions by 40% by 2030 and promote the transition to a net-zero economy. This law was drafted through a process of civil participation, testament to a commitment to social inclusion. A relevant mechanism of this legislation is the Climate Fund, which directs resources from environmental taxes to climate mitigation and adaptation projects. Complementing these initiatives, the Catalan Energy Institute developed the National Pact for the Energy Transition of Catalonia, which seeks to achieve a 100% renewable energy matrix by 2050, prioritizing energy efficiency, decentralized energy and civil empowerment.

At the local level, Barcelona stands out for its pioneering actions. The city has been implementing mitigation measures since the late 1990s, such as the Solar and Thermal Energy Regulation (1999), the Energy Efficiency Plan (2002), the Photovoltaic Energy Regulation (2011) and the Barcelona Energy, Climate Change and Air Quality Plan (2011-2020). Barcelona is also a signatory to the Pacto de Alcades (Covenant of Mayors), committed to exceeding European emission reduction targets.

At the COP21 (2015), where the Paris Agreement was signed, the Barcelona Climate Commitment (2015-2017) was presented, consolidating Barcelona as a pioneer in joining forces to mitigate and adapt to climate change in an equitable and participatory manner. As a result, the Barcelona Climate Plan (2018-2030) was established. It included ambitious targets of reducing emissions by 45% by 2030 and achieving climate neutrality by 2050, through integrated actions in mitigation, adaptation, climate justice and participatory governance. More recently, Barcelona has made even more ambitious climate commitments, stemming from the 2021 Climate

Emergency Action Plan and the 2024 Barcelona City Climate Agreement, all of which call for action in the face of the climate emergency.

By incorporating nature-based solutions, such as green roofs and greenways, ecological corridors and infiltration gardens, Barcelona is becoming a global benchmark in sustainability. An iconic urban adaptation strategy in Barcelona refers to climate shelters. Little known in Ibero-American cities, climate shelters comprise spaces (open or closed), properly signposted, where the population can take shelter from high temperatures during the summer and low temperatures during the winter, with access to water and a place to rest (Martín-Vide; Moreno Garcia, 2024). In Spain, the city of Barcelona was a pioneer in implementing a climate shelter network, with currently over 350 spaces. Another interesting adaptation measure in Barcelona is a network with more than 100 drinking water fountains for the population. In addition, it is worth mentioning the iconic urbanistic project of superblocks. This is recognized by the United Nations Environment Program (UNEP) as an innovative example of combating climate change, since it ensures the expansion of green areas and the improvement of air quality, noise pollution and urban mobility, further consolidating Barcelona as a global reference in urban sustainability (Frago; Morcuende, 2024).

In Brazil, climate governance is guided by the National Policy on Climate Change (NPCC) of 2008. The NPCC made a commitment to reduce GHG emissions between 36.1% and 38.9% by 2020, established guidelines for environmental preservation, reducing deforestation in the Amazon by 80% and in the Cerrado by 40%, and has encouraged the creation of sectoral plans. One of the main instruments of the NPCC is the 2008 National Plan on Climate Change (NPCC), which emphasized integration between different spheres of government and laid the foundations for federal climate governance, as pointed out by Santos (2021).

Another instrument of the NPCC is the National Plan for Adaptation to Climate Change (PNA) launched in 2016. This plan expanded climate actions in the country by addressing specific sectors, such as water resources, health, agriculture, and cities, integrating principles of sustainable development and climate justice. Currently, both the NPCC and the PNA are being updated. The new Climate Plan (2024-2035) provides for national mitigation and adaptation strategies, with sectoral plans and a cross-cutting approach that includes financing, a fair transition and monitoring. Furthermore, also in 2024, the Ministry of Environment and Climate Change (MECC) published Ordinance 1.256, offering technical and financial support for the preparation of Municipal Plans for Adaptation to Climate Change (AdaptaCidades), aimed at strengthening action at the local level.

Nevertheless, a review of climate policies and the current Federal Government's commitment to the issue (Vilani; Ferrante; Fearnside, 2023) led to the presentation in 2024, during COP29, of a new Nationally Determined Contribution (NDC), with bolder commitments for Brazil. It includes targets to eliminate illegal deforestation by 2028, reduce GHG emissions between 59% and 67% by 2035 and achieve carbon neutrality by 2050. Despite criticism related to the concept of net zero emissions (Bayrak; Marafa, 2016; Pajares, 2024; Smil, 2024), these targets represent a significant advance in tackling climate change, especially in light of the previous federal government' legacy, which involved the dismantling of organizations and the repeal of several environmental policies (Ripple *et al.*, 2016, 2021;).

At the regional level, the state of Goiás has a robust policy guided by Law 16.497/2009, which established the State Policy on Climate Change (PEMC), with principles and guidelines for climate mitigation and adaptive action. However, it was only in 2021 that the State Plan for Mitigation/Adaptation to Climate Change and Sustainability in Agriculture was established as a legal instrument to reduce GHG emissions. The Goiás Carbon Neutral Strategy, launched in 2023, set targets of 25% emission reduction by 2025 and 50% by 2030, and of neutralizing carbon emissions by 2050. To this end, programs such as REDD+ Goiás and PSA Cerrado em Pé have contributed to the implementation of regulatory, administrative, and financial structures for forest conservation and lowcarbon rural development. Another recent initiative is the Goiás Resilient Program, launched in 2024, which aims to improve the technical and operational capacity of municipal civil defense organs, to ensure the integration of calamity risk reduction policies, and to foster community participation and the adherence of local governments to the Federal Government's AdaptaCidades.

At the local level, Goiânia stands out for its Municipal Master Plan (PDM), launched in 2007 and updated in 2022. This is a planning and territorial organization instrument that incorporates guidelines for tackling climate change, encouraging sustainable practices and clean technologies. In 2011, the city also developed the Goiânia Sustainable Plan, within the scope of the Emerging and Sustainable Cities Platform of the Inter-American Development Bank (IDB). Additionally, the city has policies focused on urban mobility, sanitation, solid waste, and civil defense. More recently, the Goiânia Resiliente Report (Novaes; Ramalho, 2024) presented a diagnosis of the municipality's vulnerability and exposure, proposing guidelines to increase the municipality's climate resilience, including green infrastructure, water management, air pollution control and climate financing mechanisms.

Comparative analysis of Spanish and Brazilian legislation

Climate legislation in Spain is integrated and clear, with specific guidelines, whereas in Brazil it is fragmented, making implementation and integration between different levels of government difficult (Neves; Chang; Pierri, 2015). The National Policy on Climate Change (NPCC) faces challenges, such as a lack of command and control instruments, as well as the non-implementation of the Brazilian Emissions Reduction Market, which was only regulated in 2024.

Spain also stands out for the implementation of well-funded adaptation and mitigation programs, with a focus on nature-based solutions and citizen participation. In Brazil, the implementation of climate programs is hampered by a lack of resources and technical support (Setzer; Macedo; Rei, 2015). Despite some progress in cities like São Paulo and Rio de Janeiro (Martins; Ferreira, 2011; Di Giulio *et al.*, 2018), local climate governance needs to be strengthened, as emphasized by Jacobi (2023). Local governments play a crucial role in implementing climate policies (Ryan, 2015), although they face limitations due to a lack of adequate funding, human resources and the short duration of political mandates (Leme, 2010).

In terms of mitigation strategies, Spain has adopted integrated actions that combine mitigation and adaptation, such as climate monitoring networks and coastal management. In Brazil, policies focus on combating deforestation and renewable energy, with few adaptation initiatives (Rodrigues, 2014; Chiquetto; Nolasco, 2024). Nonetheless, both countries face financial barriers and political resistance, in addition to a need for better intersectoral coordination.

INSIGHT FOR STRENGTHENING BRAZILIAN CLIMATE GOVERNANCE

The Spanish experience suggests that climate governance in Brazil should be improved through unified and integrated legislation across different levels of government, as proposed in the National Plan. Furthermore, it is essential to implement climate adaptation strategies, especially nature-based solutions as seen in Barcelona. Effectively implementing funding mechanisms for climate actions is also crucial, given that the National Fund on Climate Change still demonstrates an institutional weakness in mobilizing resources (Lopes; Albunquerque, 2023).

Brazil needs to strengthen its administrative structures and the technical and financial capacity of local governments in order to formulate preventive and reactive action plans in the face of climate emergencies. Of particular significance here are the initiatives of Goiás Resiliente (state) and AdaptaClima (federal). It is also vital to guarantee climate justice, in the sense of ensuring the participation of civil society in the formulation of climate policies. Moreover, it is necessary to invest in climate education so as to raise awareness about the impacts of climate change and about the need to adopt different habits (Rosa, 2021). Actions that reduce social and economic inequalities, and democratize access to resources which increase

the capacities of individuals and infrastructures should also be prioritized to build more resilient cities and communities (Ioris; Irigaray, Girard, 2014).

CONCLUSION

Climate governance in Brazil and Spain reflects the commitment of these two countries to mitigate and adapt to the impacts of climate change. Although both Brazil and Spain have made significant progress in climate policies, they face distinct challenges. Spain stands out for its integration with European Union guidelines and multiscalar governance, whereas Brazil faces the challenge of balancing ambitious goals with environmental preservation and the promotion of socioeconomic development. Local initiatives, such as those in Barcelona and Goiânia, show that cities have a vital role to play in building resilience and implementing innovative solutions for the climate crisis.

The aforementioned laws and plans reflect multiscalar approaches, integrating national, regional and local policies to address climate challenges. A comparative analysis of these initiatives offers valuable insights for improving Brazilian climate governance, inspired by Spanish best practices. Areas of interest include cooperation between different government levels, securing climate funding, strengthening local governance, promoting climate justice, as well as a sustainable and inclusive energy transition. Adopting innovative solutions and promoting a greater integration between administrative spheres are crucial steps to ensure a fair and resilient transition. Dialogue between nations should be encouraged to share experiences and address global climate challenges in a cooperative manner.

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